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EVALUATION OF SELECTED ASPECTS OF EDMS IMPLEMENTATION IN HOSPITAL

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Purpose: The aim of the article is to assess selected aspects of the implementation of an electronic document management system, which is based on the presented case study. Concerning a review of the literature, key success factors in this area that were identified and analyzed based on a selected implementation project.
Design/methodology/approach: The research was conducted by using a case study combined with the use of direct observation by the co-author of the article. The selection of a clinical hospital in the discussed scope allows for the formulation of appropriate final conclusions.
Findings: The analysis of the case study allows for the formulation of conclusions regarding implementation projects in the field of electronic document management system in healthcare units.
Research limitations/implications: Using a case study of one hospital confirms a limitation in the complete generalization of the final conclusions.
Originality/value: The article indicates important aspects of conducting research in the field of management of IT project implementations in healthcare units. For practitioners associated with the healthcare sector, the article can be a reference point in searching for inspiration and good practices in the discussed research area.
Keywords: electronic document management system; hospital, change management, project management.
Category of the paper: Case study.

1. Introduction

The issue of implementing innovative solutions in the health care sector has been playing an important role for many years (Głód, Głód, 2014). Technological and IT technologies play a crucial role in this area. The healthcare sector is a knowledge-based industry, therefore its computerization should bring new opportunities (new quality) in the medical and organizational fields. Unfortunately, it is not satisfactory either in terms of the pace of its implementation or because of the results achieved. This may be the result of unstructured and chaotic computerization processes by individual medical entities (Pawłowska, 2015).

What seemed to be an innovative solution a few years ago (Strzelecka, 2015) is now becoming a standard and a necessity in increasing efficiency in everyday work. In addition, the experience of the pandemic situation and the need to use remote work have strengthened trends in this area (Almacen, Cababaluna, 2021; Rogalska, Syrkiewicz-Świtała, 2021). In this context, the implementation of electronic document circulation is a challenge for many healthcare entities in Poland (Tynda, 2008), and the search for key success factors of this type of projects that would be a significant research challenge (Fontainha, Martins, Vasconcelos).

2. Implementation of the Electronic Document Management System (EDMS)

The implementation of the EDMS system in the computerization process consists of an internal organizational change. This system is a completely new tool that is designed to improve the performance of office activities, including the collection, storage, sharing and archiving of documents in electronic form. The entire process of computerization consists in the introduction of modern tools and methods of conduct in the entity, both in contacts inside and outside the administration, which is why the proper implementation of the EDMS system, which is important in this process (Adamus-Kowalska, 2018).

The internal area of organizational change during the implementation of EDMS, in the process of computerization of public administration, should include: − implementation of ICT tools of the EDMS system, − elimination of paper documents within the organization, − appointment of a coordinator of office activities and granting him appropriate authorizations in the EDMS system, − change of internal regulations governing the manner of conducting cases, − training and introduction of employees to work in the EDMS system, − continuous improvement and motivation of employees to work in the EDMS system.

The external area of organizational change during the implementation of EDMS, in the process of computerization, should include: − communication with external entities via electronic channels of information flow − digitization of public services through the wider use of dedicated systems to handle specific tasks performed by the administration, − elimination of paper documents sent externally, − creation and use of modern applications for communication with public administration, in particular on mobile devices, − constant monitoring of the level of use of electronic tools for communication and periodic assessment of the entity in terms of the level of computerization (Adamus-Kowalska, 2018, pp. 161-162).

Electronic Document Management System (EDMS), as defined in the Regulation of the Prime Minister of 18 January 2011, is an ICT system for electronic documentation management enabling the performance of office activities, documenting the course of handling cases and collecting and creating electronic documents.

The main purpose of the EDMS system is to make it possible to perform work that previously was required a longer and more expensive paper route, with the use of computer equipment that facilitates operation and shortens working time (Hic, Nowakowski, 2017, p. 27). The Electronic Document Management System is often analysed in the context of processing a specific type of documents, for example accounting documents (Kotyla, 2021), and in the context of a specific type of organisation, including healthcare entities of interest in this article (Sánchez, Savin, Vasileva, 2005).

In this context, it is important to identify the key success factors for the implementation of EDMS systems (Ziemba, Papaj, Descours, 2022). Alshibly, Chiong and Bao categorized this in this regard (Table 1).

Table 1.
Categorization of CSFs for EDMS implementation

Factor groupings CSFs	**Factor groupings CSFs**
Technological readiness	Architecture readiness. Infrastructure readiness. Process readiness
Top management support	Top management, leadership, and commitment toward EDMS. Top management encouragement toward utilization of EDMS. Clear mission developed regarding business objectives. Top management encouragement toward formal/informal. Communication. Gaining commitment and support of chief executive officers. Planning and project management
Training and involvement	Providing the employees with adequate information of EDMS related principles through training. Adequate training and support for users. Employees are trained on EDMS job-specific skills. Involving EDMS end users. Management always updating their knowledge. Involving all levels within the organization and external stakeholders. Actively encourage employee participation in EDMS-related decisions

Cont. table 1.

Resource availability	Prior existence/development of necessary infrastructures. Sufficient financial resources provided to support EDMS implementation. Human resource availability. Technical resources (e.g., software, equipment) are provided. Requirement-driven procurement planning
System-related factors	EDMS functionality. Effectiveness of EDMS. Efficiency of EDMS. User friendliness of EDMS. Usability and understandability of output Integrating systems and technology. Demonstrating benefits. Piloting and testing
Work environment and culture	Policies and guidelines. Communication. Aligning projects with business objectives. Ensuring a project has a clear agenda. Change management. Sharing expertise. A spirit of cooperation and teamwork. Supporting team-based approaches to problem solving

Source: Alshibly, Chiong, Bao, 2016, p. 293.

An important issue in this regard is certainly the appropriate preparation of staff for the implementation of this type of solutions (Jensen, 2009). It is the attitude of employees that largely determines the success or failure of the process of implementing an electronic document management system (Bobowska, 2021, p. 28).

Thanks to the implementation of electronic documentation management tools, a healthcare entity may achieve measurable benefits. The advantages of implementing this type of systems are as follows:

- remote access to public services using the Internet,
- reduction of service costs,
- increasing the availability of the entity,
- automation and acceleration of document workflow,
- the ability to manage workflows,
- monitoring of work (Raczko, 2017, pp. 41-42).

The table below presents examples of the benefits of implementing EDMS.

Table 2.
Benefits of EDMS

Benefit	**Effect level**	**Type of benefit**
Centralized storage of information	Individual user	Intangible
Improved document search		
Better quality	Individual user / Organization	
More efficient business processes		
Improved staff morale and team working		
Compliance with laws and regulations	Organization	
Transparent organizational processes	Society	
Accessible historical records		
Cost savings	Organization	Tangible
Saving floor space from document storing		
Improved productivity and competitive advantages	Organization	Tangible / Intangible

Source: Kuosmanen, 2019, p. 18.

The benefits presented may concern the level of the individual user, the organization and the society as a whole. They can be both tangible and intangible.

3. Research Method

The analyses were based on a case study on preparations for the implementation of the EDMS system in a healthcare entity. The selection of the organization due to its size, wide range of services provided and specific development, seems inspiring and correct for the possible formulation of conclusions that may also be at least partially applicable to other entities of the health care sector.

The hospital on the basis of which the assessment of selected aspects of EDMS implementation in health care was carried out is a university unit. The hospital is located in a pavilion building, where there are wards in individual buildings and laboratories as well as administration. This type of development is characteristic of hospitals from the 19th and 20th centuries, as well as when they were designed from the beginning when infectious diseases appeared. The key features and advantages of pavilion hospitals are the isolation of wards. Thanks to separate buildings, isolation between wards can be distinguished, which is particularly important in infectious diseases. Separate pavilions limit contact between patients, but also cause difficult contact between employees. The circulation of documents in a unit located in a pavilion should be organized in a way that ensures efficiency, security and transparency of processes. The hospital has 16 departments in two locations and is perceived as a comprehensive health unit in the treatment of children and adults in the field of lung diseases, neurology, internal medicine and nephrology. Each department specializes in a different area of treatment, which allows for a wide range of medical services. It employs 1024 employees, including doctors, nurses, laboratory diagnosticians, psychologists, administration and technical staff. The employees working in the system on a daily basis will mainly be the broadly understood administration, i.e. about 100 people, because it is a system for electronic management of documentation such as correspondence and financial documents, e.g. invoices. Doctors and nurses mainly use the medical information system in the field of patient treatment. On the other hand, all documents requiring the approval of the management board, i.e. consent to the tests, will take place within the EDMS system. To a large extent, the task of the system is to provide team communication in order to gain access to information.

The use of the case study aims to present and at the same time evaluate selected aspects of EDMS implementation. The analysis concerns the pre-implementation period from the second and third quarters of 2024, and the planned implementation period is to be 8 months.

The implementation of Electronic Document Management System (EDMS) in a hospital is a process that requires preparation, analysis and coordination of many technical and organizational elements. EDMS helps to organize document workflow, archiving, automation and streamline administrative processes, which increases the efficiency and availability of data. An important issue is the fact that the government administration is preparing to be included in the e-delivery system and will be obliged to do so by January 1, 2025. Local government units and their associations, metropolitan associations and local government budgetary establishments will be determined to apply the provisions of the Act with regard to the delivery of correspondence using the public registered electronic delivery service no later than from 1 January 2025, and with regard to the delivery of correspondence using the public hybrid service from 1 October 2029. At the same time, in accordance with the bill amending certain acts in connection with the development of e-administration, the provisions of the Act on the National Archival Resource and Archives will be modified.

4. Analysis of pre-implementation activities of the EDMS system

Before the introduction of the Electronic Document Management System (EDMS) system in a medical entity, several key actions had to be taken to ensure the smooth implementation and functioning of this system. The first step was to conduct a review of the organization's resources, documentation, and processes. An analysis of the current organizational structure, list of files, circulation of documents and identification of key employees who will be involved in the implementation of EDMS was carried out.

Ultimately, the EDMS implementation process will consist of the stages presented in the table below.

Table 3.
EDMS implementation stages

Stage sequence number	Stage name	Substantive scope of the stage
1.	Conducting a needs and requirements analysis	• defining the objectives of the implementation, e.g. whether the system is to support only archiving or also document circulation, digitization of paper documentation or handling administrative processes, • process analysis – identifying key administrative processes to understand which areas will need to be changed after the system is implemented, • definition of technical and organisational requirements, including necessary functionalities, level of access to documents and regulatory compliance.

Cont. table 3.

2.	Choosing an EDMS system	• software selection - a decision whether to implement a ready-made commercial solution, or choose a free one (e.g. EDMS RP offered by the Polish Ministry of Digital Affairs), or create a tailor-made solution, • adapting the system to the specifics of the organization - the system must respond to specific needs, e.g. integration with existing databases or ERP systems, • compliance with legal regulations, in particular with regulations on the protection of personal data (GDPR) and archival requirements (e.g. regulation on the classification and qualification of documents).
3.	Preparation of technical infrastructure	• hardware and software update - the EDMS system often requires a more powerful server infrastructure and appropriate database software, • integration with other systems - EDMS must be integrated with systems that the hospital already uses (e.g. ERP, financial systems, HR), • Security - Installing appropriate security measures, including access controls, encryption, and regular backups.
4.	Digitization of paper documents	• scanning documentation and converting it to a digital format, in compliance with legal requirements for electronic archiving, • creating a digital archive and classifying documents according to categories, dates or departments in the EDMS system.
5.	Development of new procedures and training of employees	• defining the rules and procedures for working with EDMS, including workflows, case classes and archiving rules, • preparation and implementation of security policies and rules for access to documents, • employee training – providing support and training in the use of the EDMS system and user manuals for various groups of users.
6.	Testing the EDMS system	• pilot: implementation of the EDMS system in one of the organizational units as a pilot project to check how the system works in practice and catch any errors, • testing the circulation of documents and the functions of searching, registering and archiving documents in order to ensure their correct operation, • collecting user feedback and making possible adjustments and adjustments based on feedback.
7.	Full system implementation and monitoring	• introduction of EDMS throughout the organization and monitoring of its functioning, which allows to detect possible problems and introduce further improvements, • technical support and updates - regular updates of the EDMS system and monitoring of its operation to ensure smooth document handling, • effectiveness assessment - periodic reviews of effectiveness and analysis of whether EDMS meets the assumed goals.

Source: own work.

On the basis of the general substantive scope of the schedule presented above, it was only possible to develop a detailed implementation plan, taking into account the various stages of work and the involvement of relevant people.

Another important step is to determine which processes in the organization will be covered by the EDMS system, as well as to identify possible exceptions that will require separate proceedings. It is crucial to develop consistent rules for the electronic circulation of documents, registration, assignment, signing documents, archiving, etc. It is also worth analyzing which documents can only be kept in electronic form, and which will require paper form. In order to implement EDMS, it is also necessary to properly prepare the organization's technical infrastructure. Computer hardware, software, configuration of accesses and permissions, as well as the means to securely store and archive electronic documents must be provided.

It is also crucial to upload qualified certificates that allow documents to be signed electronically. An extremely important element before the launch of EDMS was training for employees who will use the system. Users should be trained in the use of the system, new rules of document circulation, signing documents electronically, as well as archiving. It is also worth appointing people responsible for supporting users and solving current problems. The introduction of EDMS is associated with a change in the way employees work and habits. Therefore, effective internal communication is crucial, informing about the benefits of implementing the system, as well as about new rules and processes. It is necessary to change the organizational culture so that employees are open to new solutions and actively participate in the implementation of EDMS. To sum up, before implementing EDMS, it is crucial to comprehensively prepare the organization - from resource review, through process definition and infrastructure adjustment, to employee training and organizational change management. Only such a comprehensive approach will ensure the smooth implementation and effective functioning of the EDMS system in the long term.

During the pre-implementation analysis, the general operation of the system was discussed with the employees participating in the process in terms of:

1. generating barcodes from the system, rules for sticking documents with barcodes, using the code in the document registration process,
2. rules for registering cases on the example of correspondence, case registration window on the example of correspondence, file of the created case, instructions, tabs collecting other information in the case, rules for attaching document files, document versions, case linking, case registers with search options,
3. granting permissions, i.e. to each document of a given type,
4. tasks in the user profile, tasks for the department, notifications about a new task, task deadline and visibility of the deadline in the document register,
5. the way the system supports the storage of attachments in any format, documents attached in the system after clicking on a link open in programs designed to support a given format,
6. e-Delivery: this is an electronic equivalent of a registered letter with acknowledgement of receipt, from the EDMS system, it will be possible to send, receive and track the status of the shipment, thanks to full integration with the Poczta Polska system,
7. e-Sender: the service allows you to generate envelopes with the sender's, addressee's data and the number of the contract with Poczta Polska. All you have to do is print out the envelope generated from the system and take the parcel to the post office without having to receive a confirmation of postage there,
8. ePUAP.

During my daily observations of work in the field of traditional, i.e. paper-based document workflow, many observations came to mind, which in turn strengthened the change management process in this area. Pointing out significant benefits from the implementation of a new solution, also of an organizational nature, is a key success factor in this aspect.

Paper document workflow has many disadvantages, especially compared to modern, electronic document management systems. The most important are:

1. Time-consuming – transferring documents between people or departments takes time, especially in pavilion buildings. Employees have to manually deliver documents or wait for them to be delivered, also the need to manually complete, segregate and sign documents is time-consuming, which prolongs decision-making and administrative processes.
2. Risk of losing or destroying documents – paper documents can easily be lost or accidentally destroyed (e.g. by water, fire or improper storage). Paper documents can be difficult to find, especially with large archival collections, which creates the risk of missing important information.
3. High costs of storage and maintenance – storing paper documents requires additional space, e.g. cabinets, archives, and even separate rooms, which is already problematic in the hospital.
4. Difficult access to documents – searching for documents in paper archives is time-consuming and requires manual search through physical collections. Another issue is the fact that only one person can view a given document at a time, which limits the availability of data for more employees, especially when the document has to go through several people in a short time.
5. Limited control over access and security – paper documents are more difficult to secure. They can be easily copied or extracted without proper control procedures, increasing the risk of unauthorized access. It is difficult to keep track of who has reviewed or changed documents, which can lead to problems with oversight and accountability.
6. Difficult collaboration and lack of flexibility – Difficulty sharing documents quickly makes collaboration limited, especially when employees are in different locations or working remotely. Documents are not accessible outside the office, which limits the possibility of remote work or access to data in emergency situations.
7. Lack of automation and limited reporting capabilities – paper document workflow does not allow for process automation, which increases the number of manual tasks and the risk of mistakes. It is difficult to generate reports and track administrative processes, as documentation must be manually searched and processed.
8. ecological burden – paper production, transport and disposal generate an ecological footprint and contribute to the depletion of natural resources and CO_2 emissions. For paper-intensive institutions, cost-effectiveness and environmental performance can be significantly lower than for digital workflows.

Traditional, paper-based workflows therefore have numerous limitations that can affect efficiency, data availability, as well as costs and security. Electronic documentation systems are the answer to many of these problems, improving the accessibility, safety and environmental performance of the organization.

The traditional document workflow currently in force in a hospital is described in the document flow manual and applies to paper documentation and the physical movement of documents between departments or people.

The process can be broken down into the following activities related to the circulation of documents:

1. After holding the document in an electronic version, hospital employees print it out and, as in the case of the paper version, then hand over the document to the Office.
2. The persons running the Office accept all external documents provided by the post office, Hospital employees and individuals, the institutions then stamp the documents with a stamp of receipt as well as a stamp needed to describe the document in terms of content as well as formal and accounting. Then they enter it in the correspondence book and assign a sequential number. The received correspondence is forwarded on the day of receipt or on the next working day against a receipt to the appropriate organizational units.
3. Purchase invoices, after registration in the Office, are forwarded to the substantive departments for substantive control within 4 working days (i.e. confirmation of the performance of the service, compliance of the performance with the order, entering the contract or order number and payment date).
4. External and internal correspondence, after registration in the Office, is forwarded to the Director's secretariat, who assigns it to individual cells, and then forwards it back to the Office, which divides it into the indicated cells.
5. After checking the documents in terms of content, individual departments submit the evidence to the Hospital Office. The Office submits the documents to the Finance and Accounting Department at the latest on the next working day in order to carry out a formal and accounting control.
6. Formally and accounting-checked documents are qualified for inclusion in the accounting books by indicating the month and the method of assignment and the signature of the person responsible for these indications within 5 working days of receiving the document from the Office.
7. Then the Finance and Accounting Department transfers it in folders to the Chief Accountant, where a preliminary control is carried out by the Chief Accountant and approval for implementation (payment) by the Director.
8. In the case of orders or tenders, individual departments prepare documents, which are then forwarded to the Director's secretariat.

9. From the secretariat, the files of individual departments are collected by the Chief Accountant.
10. The Chief Accountant, after approval in the financial scope, forwards the folders with documents to the Director.
11. After approval by the Director, some of the documents are sealed by the secretary and only from the Secretariat the signed files are collected by individual substantive departments.

Due to the fact that the Hospital is located in a pavilion structure, a person often has to travel with the document at least twice, and sometimes even more times. Weather conditions are a big difficulty. First, by submitting the document to the Office, then on the next day by collecting it and returning its approval in terms of content. In the event that mail is collected from the Polish Post Office and handed over in a traditional way by the postman, the Office is closed at that time, which causes another loss of time for employees who want to hand over or collect documents from the Office. In the paper version, everything is based on the transfer of the paper version between units. Due to this fact, it is difficult to locate the document, the only option is to make a phone call or visit the Office in person, where you can check whether such a document has been received by the unit at all. Unfortunately, this is not an easy process, because checking the paper correspondence book requires a lot of time, and sometimes in a situation where it is not known in what period a given correspondence has been received by the Hospital, it is even impossible. Another important problem is the inability of the Directorate to identify at what stage a specific case is.

At the stage of pre-implementation analysis, the following scopes were established:

Incoming correspondence

1. The correspondence registration window will allow you to enter the following data: barcode, external case number, form of delivery, type of sender - contact/contractor checkbox, sender - selection of the sender from the database or the possibility of creating a new one, type of correspondence, responsible person/department, date and time of receipt, date from the document, postal number, related documents - field with the register of incoming, outgoing and internal letters, description, attachments.
2. Correspondence can be registered from the command under the navigation button, an e-mail sent to the mailbox connected to the system, e-Delivery and ePUAP.
3. The system will register correspondence that has been received on paper via traditional mail, by courier, by e-mail, in person, e-Delivery, ePUAP.

Incoming correspondence

1. The incoming correspondence workflow will work according to the following process description:
   - When receiving correspondence, the Law Firm verifies to whom it is addressed, none of the employees prints the documents that they receive to their e-mail box, but sends them in an electronic version to the address of the Office.
   - The Law Firm registers the letter and forwards it to the Director within the scope of the Ministry of Health and the National Health Fund, while the remaining correspondence is sent directly to the organizational unit to which the case relates, bypassing the Director's assignment.
   - Case handling - if the correspondence is addressed to a department, the Law Firm forwards the letter directly to the indicated department in order to take up and complete the case. In a situation where the letter in which the Director is indicated by the registrant will be forwarded directly to the Director.
   - Director's approval - the letter goes to the Director and the Director may:
     1. reject - refer the case back to the responsible department to improve the response,
     2. accept the prepared response and forward the information to the responsible department,
     3. terminate.

The hospital's management department will have access to all correspondence of the hospital, at any time it will be able to view what correspondence has been received by the unit, at what stage a specific case is and which department is currently dealing with it.

Internal correspondence

Two types of internal correspondence workflow paths will be created, one correspondence to the Director (1), the other will be employee correspondence (2).

Process Description 1:

- each employee has the option of sending internal correspondence,
- during the registration of internal correspondence to the Director, the letter will be sent directly to the Director,
- The Director, after reading the letter, decides on the method of response,
- the employee, after receiving a response from the Director, may end the case, or prepares a response to the Director.

Process Description 2:

- each employee has the option of sending internal correspondence,
- during registration, you can immediately indicate the person who is the recipient of the correspondence,
- A dedicated employee ends the document workflow or can assign it to another person for further service.

Outgoing correspondence

- correspondence registered by the Law Firm will be immediately placed in the register of outgoing letters with a sequential number of the outgoing letter,
- correspondence registered by employees will be sent to the Office and it is the Office that will create new outgoing correspondence,
- the system will have the option to generate labels for printing with the name and address of the recipient and the number.

Before implementing EDMS, it was important to have a thorough understanding of the specifics of the hospital's operations, the types of documents that will be managed, and the flow of information. This helped to adapt the system to the needs and eliminate potential problems at later stages. Employees should be familiar with the functions and operation of EDMS, so it was important to organize appropriate training. The introduction of practical exercises allowed for a better understanding of the system and will prepare employees to work with it on a daily basis. After the implementation of EDMS, it is important to regularly monitor its operation and effectiveness in document management. It is worth collecting feedback from users and conducting periodic evaluations of the system to constantly improve it.

5. Conclusions

The electronic circulation of documents was introduced to increase the efficiency of the hospital's operations, it is aimed at simplifying the process of implementing a given case and reducing the number of stages of settling the case. Computerization of the document workflow process allows for many key improvements and benefits for the unit. Electronic document workflow significantly speeds up the flow of information and documents in the hospital, eliminating the time needed to manually transfer, copy and store paper documents.

Processes are automated and documents can be quickly uploaded, viewed, accepted and archived electronically. This saves time for employees who can concentrate on other tasks. It provides central storage of all documents in digital form, which allows better control over the circulation and status of cases. Employees have convenient and quick access to the process history and full documentation. In addition, the system provides document validation and electronic signature support, guaranteeing the integrity and authenticity of data. It can significantly reduce the costs associated with printing, copying, scanning and physically archiving paper documents. In addition, the digitization of processes reduces the need to store large amounts of paper and enables better management of office space.

The electronic document workflow system improves the organization and transparency of the flow of information in the medical entity. It allows you to automatically assign tasks, monitor progress, generate reports, and optimize business processes. Thus, it ensures better coordination of activities between employees. Compared to paper document workflow, the electronic version offers a higher level of data security. Documents are protected against destruction, loss or unauthorized access.

An electronic workflow system can also provide encryption, backup, and change tracking, increasing information security. The electronic form of documents allows multiple employees to access and collaborate on the same materials at the same time, regardless of their location. This allows you to improve teamwork and speed up decision-making. Employees have constant and convenient access to the necessary documents.

To sum up, the computerization of document circulation brings numerous benefits to the hospital, such as increased efficiency, improved management, cost reduction, improved process organization, and a higher level of data security and availability.

The implementation of EDMS requires a consistent approach and cooperation between different departments of the organization to ensure smooth and consistent activities.

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